Sunoco Inc.
100 Green Street
PO Box 426
Marcus Hook PA 19061

CERTIFIED MAIL RETURN RECEIPT: 7006 0810 0002 4549 2051

January 29, 2010

Director, Air Enforcement Division
Office of Civil Enforcement
U. S. Environmental Protection Agency
Mail Code 2242-A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460-0001

RE: USA v. Sunoco, Inc. et. al. – Civil Action No. 05 CV-02866
8th Semi-Annual Progress Report
July 1, 2009 to December 31, 2009

Dear Sirs:

Pursuant to Paragraph #114 of the Consent Decree entered in the above noted Civil Action, enclosed is Sunoco's eighth Semi-Annual Progress Report.

Should you have any questions concerning the enclosed report, please contact me at 610-859-1695.

I certify under penalty of law that this information was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my directions and my inquiry of the person(s) who manage the system, or the person(s) directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete.

Signed: Terry A Soulé Date: 1/27/10
Terry A. Soulé
Director, Environmental Services & Policy
Sunoco, Inc.

Sincerely,

Terry A Soulé
Terry A. Soulé
Director, Environmental Services & Policy
Sunoco, Inc.

File: Global Settlement Periodic Reports, 2010
M:\LFRASHER\CONSENT DECREE\2010\8th Semi-Annual Progress Report Jan 2010\Cover Letter – January 2010 Semi Annual Progress Report

cc: Chief, Environmental Enforcement Section
Environmental & Natural Resources Division
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P. O. Box 7611
Ben Franklin Station
Washington, DC 20044-7611
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Director, Air Enforcement Division
Office of Civil Enforcement
c/o Matrix New World Engineering
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East Hanover, NJ 07936-3159
Certified Receipt: 7006 0810 0002 4549 2075

U. S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103
Certified Receipt: 7006 0810 0002 4549 2082

Pennsylvania Department of Environmental Protection
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Certified Receipt: 7006 0810 0002 4549 2440

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Pennsylvania Department of Environmental Protection
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Norristown, PA 19401
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Oklahoma Department of Environmental Quality
707 N. Robinson
Oklahoma City, OK 73102
Certified Receipt: 7006 0810 0002 4549 2105

Philadelphia Air Management Service
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Philadelphia, PA 19104
Certified Receipt: 7006 0810 0002 4549 2112

Ohio Environmental Protection Agency
Central District Office
50 W. Town Street, Suite 700
Columbus, OH 43215
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Sunoco Facility: Marcus Hook
Report Title: Semi-Annual Consent Decree Compliance Report #8
Reporting Period: 7/1/09 – 12/31/09

Paragraph 114 Reporting and Recordkeeping of Affirmative Relief / Environmental Projects and Emission Data in Section V with Certification

I. Progress Report for Implementation of (section V) Affirmative Relief/Environmental Projects

A. NOx Emissions Reductions from the FCCU

Engineering design work for Marcus Hook is progressing.

B. SO2 Emissions Reductions from the FCCU

Engineering design work for Marcus Hook is progressing.

C. Control of PM Emissions from FCCU

Paragraph 16 – Marcus Hook has been compliant with the 1.0 lbs/1000 lbs of coke burn PM requirement as demonstrated in July 2009 using a method 5 test.

D. Control of CO Emissions from FCCU

Paragraph 19 – Marcus Hook Refinery is compliant with the requirements of this paragraph. There were deviations due to upsets to the one hour CO standard.

E. NSPS Subparts A and J Applicability at FCCU Regenerators

Paragraph 25 – Marcus Hook is compliant with Subparts A & J.

F. NO_x Emission Reductions from Heaters and Boilers

Paragraph 31 – An updated detailed NOx Control Plan was submitted to EPA and the Appropriate Plaintiffs/Intervenors on 07/14/09.

G. SO_2 Emissions Reductions from and NSPS Applicability for Heaters and Boilers

Paragraph 37 – No changes have been made since the last progress report.

I. Sulfur Recovery Plants - NSPS Applicability

Marcus Hook is compliant with Subpart J for Sulfur Plant/Tailgas Units.

J. Hydrocarbon Flaring Devices

Paragraph 48 – Alternative Monitoring Protocols ("AMPs") for the 10 Plant and 12 Plant Flares were submitted to EPA on November 12, 2008 and implemented beginning January 1, 2009. The AMPs were approved by the EPA on May 19, 2009.

K. Control of Acid Gas Flaring and Tail Gas Incidents

Paragraphs 52 & 53 – Sunoco had no Acid Gas or Tail Gas incidents during this reporting period.

L. Control of Hydrocarbon Flaring Incidents

Paragraph 64 – Marcus Hook had one Hydrocarbon Flaring incident during this reporting period. The incident occurred on December 21, 2009. The Root Cause Failure Analysis investigation report is attached in Appendix I.

M. Benzene Waste NESHAP Program Enhancements

Paragraphs 65-77

1. **The BWON exempted quantity was calculated to be 0.121 MG for the third quarter and 0.079 MG for the fourth quarter of 2009. The 2009 annual BWON exempted quantity, based on EOL sampling, is calculated to be 0.364 MG. See Appendix II.**

2. **EOL sampling was conducted in the fourth quarter for Refinery BWON units, to determine any benzene concentration changes after the 3rd and 4th quarter shutdowns of the Ethylene Oxide, Cyclohexane and HRI units. Results were largely consistent with previous EOL sampling.**

N. Leak Detection and Repair Program Enhancements

Paragraphs 78-92

1. **LDAR Monitoring Technician Refresher Training was completed in December 2009.**

2. **Marcus Hook Refinery upgraded to version 4 of the LeakDas software in the second half of 2009.**

O. Incorporation of Consent Decree Requirements into Federally Enforceable Permit(s)

Paragraphs 93-96: The Marcus Hook Refinery is compliant with the requirements of these paragraphs.

II. Summary of (section V) Emissions Data

Included herein.

III. Description of Any Problems Anticipated with Meeting (section V) Requirements

N/A

IV. Additional Matters to be Brought to the Attention of EPA and the Appropriate Plaintiff/Intervenor

N/A

Paragraph 112 SUPPLEMENTAL AND COMMUNITY ENVIRONMENTAL PROJECTS (SCEP) AND STATE AND LOCAL ENVIRONMENTALLY BENEFICIAL PROJECTS (SLEBP) in Section VIII with Certification

I. Progress Report for Each SCEP or SLEBP (section VIII)

Paragraph 104: In progress

Paragraph 105: Complete

Paragraph 106: Complete

Paragraph 107: Complete

Paragraph 108: Complete

Paragraph 109: Complete

II. Completed SCEP or SLEBP (section VIII)

A. Detailed Description of Each SCEP or SLEBP Project as Implemented

N/A

B. Brief Description of Any Significant Operating Problems Encountered

N/A

C. Certification That Each Project Has Been Fully Implemented Pursuant to the Provisions of this Consent Decree

N/A

D. Description of the Environmental and Public Health Benefits Resulting From Implementation of Each Project (including quantification of the benefits and pollutant reductions, where practicable)

N/A

APPENDIX I

Marcus Hook
Hydrocarbon Flaring Incident

Investigation Report for Acid Gas Flaring or Hydrocarbon Flaring Resulting in ≥ 500 lbs. of SO_2 Released

Date of Report:	1/05/10	**Incident Type:** (Check one)	☐ Acid Gas Flaring: ☒ Hydrocarbon Flaring:
Date(s) of Incident:	(Beginning) 12/21/09 (End) 12/21/09	**Flaring start/end time:**	from 5:14 PM 12/21/09 to 7:30 PM 12/21/09
Amount of SO_2 Released:	EC flare 725 lbs Pounds ☒ Tons ☐	**Location at the Marcus Hook Refinery:**	12-3 Flare ☐ 10-4 Flare ☐ EC Flare ☒

Incident Description: Fluid Catalytic Cracking Unit (FCC) gases are processed via a compressor that is called the Elliot Compressor. During a startup of the FCC unit on 12/21/09 the Elliot Compressor automatically shutdown due to a high liquid level in the knock out pot (V-495) in front of the compressor. This automatic shutdown is by design. When the compressor shutdown, the FCC generated gases were automatically sent to the flare until the Elliot Compressor was restarted.

After review of the incident it was determined that the high liquid level found in the Elliot Compressor's knock out pot originated from a high liquid level in the FCC Unit's Gasoline Seperator, V-17. During the startup, high liquid carryover resulting from unstable transient conditions caused level control problems (LC347) in V-17. This high level in V-17 resulted in some liquid making its way into the wet gas line that feeds the compressor's suction line. This liquid accumulated in the Compressor's Knock Out Pot and resulted in the Elliot Compressor Shutdown.

It was determined that the level control valve on V-17 had some response issues.

Root Cause of Incident: Unable to properly control the level (LC347) in the Gasoline Seperator V-17 at the FCC unit resulted in liquid being sent towards the suction of the gas compressor. The Elliot Gas Compressor shutdown due to this liquid and flaring resulted.

Contributing Causes of Incident: None

Preventive Actions (Actions to reduce likelihood of Recurrence):
Drained the liquid from the knock out , V-495, in front of the Elliot Compressor -done 12/21/09.
Sent Instrument technicians to repair the Level Control Valve LC347 - done 12/21/09.
Reviewed Incident with all FCC unit crews and discussed improved response to high liquid level in V-17 - completed 12/31/09

Do Stipulated Penalties Apply? (Acid Gas Flare Only) YES ☐ NO ☒

If YES explain:

☐ Yes ☐ No **Error resulting from careless operation**
☐ Yes ☐ No **Failure to follow written procedures**
☐ Yes ☐ No **Failure of equipment due to failure by Sunoco to operate and maintain equipment in a manner consistent with good engineering practices**
☐ Yes ☐ No **SO_2 rate greater than 20 lbs/hour continuously for 3 hours or more where Sunoco did not follow PMO plan and took no action to limit duration and/or quantity of SO_2 emissions**
☐ Yes ☐ No **Acid gas incidents more than 5 in rolling 12 months**

Hydrocarbon incident - non acid gas flaring.

If corrective actions are not completed within 45 days from the end date of the incident, list the projected date for the follow-up report which will show corrective actions and preventive actions:

N/A: ☐ **Completed:** ☒ **Not Completed:** ☐ **Explain:**
All corrective actions completed.

Approval Section		
Title	**Print Name**	**Date**
Environmental Engineer:	Paul J. Braun	01/5/10
Environmental Lead:	Roger Lanouette	01/05/10
Operations Manager:	Scott Stebbins	01/13/10

Date of Report:	01/05/10	Incident Type: (check one)	Acid Gas Flaring: ☐ Hydrocarbon Flaring ☒

Calculation of Quantity of SO_2 Released from Acid Gas Flaring (Round to the nearest 0.1 Tons):

Tons of SO_2 = [FR][TD][ConcH_2S][$8.44x10^{-5}$] (See p. 52 of 114 CD)
FR = Average Flow Rate of Gas During Flaring Incident in scfh
TD = Total Duration of Flaring Incident in hours
ConcH_2S = Average Concentration of Hydrogen Sulfide in gas during flaring incident
$8.44x10^{-5}$ = [lb mole H_2S/379 scf H2S][64 lbs SO_2/lb mole H_2S][1 Ton/2000 lbs]

Reason for any missing data: No missing data
Basis for any data that was estimated:

Tons of SO_2 = EC flare (non acid gas) = 136 minutes/60 minutes/hr * 4.997 moles per hour of SO2 * 64 lbs/mole = 725 lbs SO2.

Rate of SO_2 Emissions During Acid Gas Flaring: ER = [FR][ConcH_2S][0.169]

ER = Emission Rate in pounds of SO2 per hour
FR = Average Flow Rate of Gas During Flaring Incident in scfh
ConcH_2S = Average Concentration of Hydrogen Sulfide in gas during flaring incident
0.169 = [lb mole H_2S/379 scf H_2S][1.0 lb mole SO_2/1 lb mole H2S][64 lbs SO_2/lb mole SO_2]

Reason for any missing data: none
Basis for any data that was estimated:

Emission Rate of SO_2 =

Comments:

None

Appendix II. Paragraph 77 Sampling Results Marcus Hook Refinery

Sample Point ID	Sample Date	Benzene Conc (ppmw)	Avg 3rd Qtr 2009 Benzene Conc. (ppmw)	Avg 4th Qtr 2009 Benzene Conc. (ppmw)	3rd Qtr 2009 Flow lbs	4th Qtr 2009 Flow lbs	3rdQ 2009 Benzene Quantity Contribution (Megagrams)	4th Qtr 2009 Benzene Quantity Contribution (Megagrams)
Waste Samples								
Spent Carbon	11/23/2009	25.0 ppm	0	25.0 ppm		11060	0	2.87E-04

Sunoco Marcus Hook Refinery
2009 Total Benzene Summary
Uncontrolled, Exempt

Unit	2009 1Q Exempt Benzene Total lb	2009 1Q Exempt Benzene Total Mg	2009 2Q Exempt Benzene Total lb	2009 2Q Exempt Benzene Total Mg	2009 3Q Exempt Benzene Total lb	2009 3Q Exempt Benzene Total Mg	2009 4Q Exempt Benzene Total lb	2009 4Q Exempt Benzene Total Mg	*Total for Year Mg*
Spills	0.01	3.54E-06	0.00	0.00E+00	0.35	1.58E-04	0.00	0.00E+00	***1.62E-04***
Waste	7.21	3.27E-03	7.81	3.54E-03	17.15	7.78E-03	11.66	5.29E-03	***1.99E-02***
Dock Pans	166.72	7.56E-02	162.00	8.21E-02	248.29	1.13E-01	162.70	7.38E-02	***3.44E-01***
Total Quarterly Benzene	**173.9**	**7.89E-02**	**169.8**	**8.57E-02**	**265.8**	**1.21E-01**	**174.4**	**7.91E-02**	
PROJECTED Annual Total Exempt Benzene for the year *(as of quarter indicated)*[1)(2)]		**3.16E-01**		**3.29E-01**		**3.80E-01**		**3.64E-01**	***3.64E-01***

Sunoco Facility: Philadelphia
Report Title: Semi-annual Consent Decree Compliance Report #8
Reporting Period: 07/01/09 – 12/31/09

Paragraph 114 Reporting and Recordkeeping of Affirmative Relief / Environmental Projects and Emission Data in Section V with Certification

I. Progress Report for Implementation of (section V) Affirmative Relief/Environmental Projects

A. NOx Emissions Reductions from the FCCU

Paragraphs 12 – 13: There were no NOx exceedances of the CD limits during the period.

B. SO2 Emissions Reductions from the FCCU

Paragraphs 14 – 15: The Philadelphia Refinery is compliant with the requirements of these paragraphs. There were no SO2 exceedances of the CD limits during the period.

C. Control of PM Emissions from FCCU

Paragraph 16 – The Philadelphia Refinery is compliant with the requirements of this paragraph.

D. Control of CO Emissions from FCCU

Paragraph 19 – There were no consent decree CO exceptions noted during the reporting period pursuant to paragraph 19.

Startup, Shutdown and/or Malfunctions:

The 500 ppm CO limit was exceeded for one hour (at 501 ppm) on September 13, 2009 during torch oil feed while starting up the 1232 Unit.

Paragraph 20 – Philadelphia Refinery is compliant with the requirements of this paragraph.

E. NSPS Subparts A and J Applicability at FCCU Regenerators

Paragraphs 24 – 25: There were no Subpart A or J exceptions during the reporting period.

However, On September 8, 2009, there was one permit opacity exception (with more than 3 minutes (4 minutes) over 20% opacity) that occurred while blowing soot. At all times the opacity was below 30% and therefore not a Subpart J opacity exception.

F. NO_x Emission Reductions from Heaters and Boilers

Paragraph 31 – An updated detailed NOx Control Plan was submitted to EPA and the Appropriate Plaintiffs/Intervenors on 07/14/09.

G. SO_2 Emissions Reductions from and NSPS Applicability for Heaters and Boilers

Paragraphs 36 – 38: There were eight three hour rolling average H2S exceedances at NSPS J regulated heaters as shown below:

On September 18, 2009, an upset of the 867 unit led to elevated levels of H2S in fuel gas. Heaters were switched to alternate fuel or shutdown; however, until this was done, the 1332 H-2 Heater exceeded the limit for three hours and the 137 Unit F-3 Heater exceeded the limit for 2 hours.

On September 23, 2009, operating problems with the MDEA System caused elevated H2S levels in fuel gas. Heaters were switched to alternate fuel or shutdown; however, the 137 Unit F-3 heater had one hour of exceedance before being shutdown.

On September 29, 2009, operating problems with the MDEA System caused elevated H2S levels in fuel gas. Heaters were switched to alternate fuel or shutdown; however, the 137 Unit F-3 heater had two hours of exceedance before being shutdown.

I. Sulfur Recovery Plants - NSPS Applicability

Paragraphs 40 – 47: The Philadelphia Refinery is compliant with the requirements of these paragraphs, although as mentioned below, operating problems of the refinery's amine system led to exceedances of the NSPS 250 ppm 12 hour average limit in September and October, 2009.

9/21/09 – 5 hours
9/22/09 – 3 hours
9/23/09 - 6 hours
9/24/09 - 18 hours
9/25/09 – 13 hours
9/29/09 – 1 hour
9/30/09 – 8 hours
10/3/09 – 17 hours
10/4/09 – 8 hours
10/27/09 – 5 hours
10/28/09 – 5 hours

Emissions associated with these events were evaluated and determined not to be Tail Gas Incidents within the meaning of the Consent Decree.

In December, 2009, Sunoco started up the new Tail Gas Treating Unit (referred to as TGTU2). The Preventive Maintenance and Operation Plan was updated to reflect the new TGTU2 as well changes to the amine systems, including the new amine system associated with TGTU2 and new carbon filtration system associated with the existing refinery amine systems.

J. Hydrocarbon Flaring Devices

Paragraphs 48 – 50: The following is a summary of options the Philadelphia Refinery has elected to comply with regarding the CD NSPS requirements for flares.

Philadelphia Flares	Compliance Status
PB North Yard LPG Flare	NSPS. **Have an approved AMP**
PB South Yard North Flare	NSPS. Operating and maintain a flare gas recovery system.
PB 867 Acid Gas Flare	NSPS. This is not currently a fuel gas combustion device. The purge and pilot gas is comprised of purchased natural gas. When the purge and pilot gas is converted to refinery fuel gas, that gas will be monitored to be compliant with Subpart J. The flare only receives non-routinely generated gases, process upset gases, fuel gas released as a result of relief valve leakage or gases released due to other emergency malfunctions.
PB 867 SWS Gas Flare	NSPS. This is not currently a fuel gas combustion device. The purge and pilot gas is comprised of purchased natural gas. When the purge and pilot gas is converted to refinery fuel gas, that gas will be monitored to be compliant with Subpart J. The flare only receives non-routinely generated gases, process upset gases, fuel gas released as a result of relief valve leakage or gases released due to other emergency malfunctions.
GP 1231/1232 Flares	NSPS status planned for 12/31/2010
GP 433 Flare	NSPS status planned for 12/31/2010

As mentioned in Sunoco's December 18, 2009 letter to Mr. James Hagedorn of USEPA, the refinery reviewed the PB North Yard LPG Flare AMP and realized that USEPA's approval of the AMP was inconsistent with Sunoco's January 2006 request. Sunoco had been under the misunderstanding that USEPA approved the requested hydrogen sulfide limit and had been analyzing for hydrogen sulfide. There have been no instances since the AMP has been in effect where any sample exceeded 20 ppm hydrogen sulfide. However, the approved AMP required checking for total sulfur rather than hydrogen sulfide. During the reporting period, after

realizing the discrepancy, we reevaluated the historical samples for total sulfur and discovered that 7 sample results exceeded 20 ppm, ranging from 23 to 80 ppm. In Sunoco's December 2009 letter, we requested that USEPA re-evaluate the original approval to change the required monitoring to hydrogen sulfide. That request is pending.

K. Control of Acid Gas Flaring and Tail Gas Incidents

Paragraphs 51 – 63: Acid gas flaring computational methods have been in place since the DOE. There were no AG flaring events to note for this reporting period.

L. Control of Hydrocarbon Flaring Incidents

Paragraph 64: There was one Hydrocarbon Flaring incident during the previous reporting period that occurred at the PB South Yard North Flare on May 26, 2009. The Root Cause Failure Analysis report was not completed before submittal of the previous semi-annual report in July 2009 and is therefore included with this report. See Appendix I.

There was one Hydrocarbon Flaring incident during this reporting period associated with the 1231 Flare. The flaring event occurred on September 14, 2009; a copy of the Root Cause Failure Analysis report is enclosed, see Appendix II.

M. Benzene Waste NESHAP Program Enhancements

Paragraphs 65-77

1. **One new refinery employee, who would eventually collect benzene waste NESHAP samples, was initially trained during the second quarter of 2009. This employee will receive refresher training in the first quarter of 2010.**

2. **The BWON exempted quantity was calculated to be, based on EOL sampling data, 0.021 MG for the third quarter and 0.056 MG for the fourth quarter of 2009. Including the first half 2009 sampling results, the 2009 annual BWON exempted quantity, based on EOL sampling is calculated to be 0.38 MG. See Appendix III for EOL sampling results.**

N. Leak Detection and Repair Program Enhancements

Paragraphs 78 – 92: The Philadelphia Refinery is compliant with the requirements of these paragraphs.

O. Incorporation of Consent Decree Requirements into Federally Enforceable Permit(s)

Paragraphs 93 – 96: The Philadelphia Refinery is compliant with the requirements of these paragraphs.

II. Summary of (section V) Emissions Data

Included herein.

III. Description of Any Problems Anticipated with Meeting (section V) Requirements

None

IV. Additional Matters to be Brought to the Attention of EPA and the Appropriate Plaintiff/Intervenor

None

Paragraph 112 SUPPLEMENTAL AND COMMUNITY ENVIRONMENTAL PROJECTS (SCEP) AND STATE AND LOCAL ENVIRONMENTALLY BENEFICIAL PROJECTS (SLEBP) in Section VIII with Certification

I. Progress Report for Each SCEP or SLEBP (section VIII)

Paragraph 104: In progress

Paragraph 105: Complete

Paragraph 106: Complete

Paragraph 107: Complete

Paragraph 108: Complete

Paragraph 109: Complete

II. Completed SCEP or SLEBP (section VIII)

A. Detailed Description of Each SCEP or SLEBP Project as Implemented

None

B. Brief Description of Any Significant Operating Problems Encountered

None

C. Certification That Each Project Has Been Fully Implemented Pursuant to the Provisions of this Consent Decree

If applicable, see the certification behind the cover letter.

D. Description of the Environmental and Public Health Benefits Resulting From Implementation of Each Project (including quantification of the benefits and pollutant reductions, where practicable)

N/A

APPENDIX I

Philadelphia
Hydrocarbon Flaring - May 26, 2009
Root Cause Failure Analysis

Investigation Report for Acid Gas, Sour Water Gas, Tail Gas, or Hydrocarbon Flaring Resulting in ≥ 500 lbs. of SO_2 Released

Date of Report:	Jan 14, 2010	**Incident Type:** (Check one)	☐ Acid Gas Flaring: ☐ Tail Gas Flaring: ☒ Hydrocarbon Flaring:
Date(s) of Incident:	(Beginning) 5/26/2009 (End) 5/27/2009	**1st Flaring start/end time:**	(start) 1:57 PM (5/26) (end) 1:30 PM (5/27)
		2st Flaring start/end time:	(start) (end)
		3st Flaring start/end time:	(start) (end)
Amount of SO_2 Released:	778 Pounds ☒ Tons ☐	**Location at the Philadelphia Refinery:**	SWS Flare ☐ 1231/2 Flare ☒ AG Flare ☐ SY N Flare ☐ North Flare ☐ 433 Flare ☐

Incident Description:

On 5/26/2009 at 1:57 PM, 1232 FCCU shut down due to the failure of "A" snort valve on J-101C blower (low air flow) which caused the Safety Manager System to divert feed and shut down the FCCU unit. The loss of the FCCU then created a Refinery steam emergency.

5/26 2:21 PM, During the initial unit trip, the loss of feed forward also reduced heat recirculation pump around flow on the Main Fractionator which is the heat energy source for the E-203 Debutanizer reboiler (C-212). This reduced the bottoms temperature of E-203 from 270 deg F to 140 deg F, and likely sent an increased volume of light ends (C2-C3 range hydrocarbons) to E-209 debutanizer. On E-209, the feed flow fell from 900 BPH to 400 BPH, but the steam flow to the reboiler (C-236) only fell by 30%. This combination increased the pressure on the top of E-209 causing flaring when the safety lifted.

5/27 12:20 AM, During the FCCU restart, excessive flaring occurred when the unit re-introduced feed on 12:20 AM. The Absorber Stripper Reboiler is supplied heat energy from the bottom stream of the Lean Oil Still. The Lean Oil Still is supplied heat energy from the recirculation pump around on the Main Fractionator. Without feed (or heat energy) in the Main Fractionator, heat must be supplied to the Absorber Stripper with steam via the C-220 exchanger (per procedure FCC III-A- 3 START ABSORBER TOWER E-201). This exchanger did not perform properly, and the Absorber Stripper bottoms temperature could not be increased above 85 deg F (compared to 195 deg F for normal operation). This allowed additional C2-C3 range material to enter the Lean Oil Still, E-203, and E-209 towers on the recovery side, which resulted in excessive flaring to maintain pressure control on each tower.

Steps taken to limit duration of flaring or quantity of SO2/Hydrocarbon released (Corrective Actions):

FCCU unit feeds and Refinery unit steam balances were adjusted in response to the FCCU unit shut down.

Operations and Maintenance personnel conducted a preliminary review of the process data and unit shutdown logic to determine cause and any other issues prior to unit restart.

J-101C, "A" Snort valve was blocked in. The Maintenance Bypass Switch was placed in the "A" position allowing maintenance and further troubleshooting of the valve. Safety review determined that J-101C Blower has complete anti-surge protection using both "B" and "C" valves allowing for restart of unit.

Root Cause of Incident:
A review of process data and unit shutdown logic history indicated that the "A" Snort Valve on J-101C Blower opened 100% resulting in low air flow to the Regenerator which initiated the automatic feed divert and shutdown of the FFCU unit. The unexpected 1232 FCCU unit trip forced 1232 and 531 to progress through unplanned shut down and start up activities.

Contributing Causes of Incident:
There was no procedure that outlines the specific process for resetting the safety manager(s) at 1232 and 531.

The C-220 exchanger referenced in the Absorber Stripper start up procedure was not functioning properly and was unable to be used effectively which resulted in insufficient reboiling capability.

1232 Start Up Sequence procedures do not mention WGS pH targets for the introduction of torch oil.

FC016 on E-209 is artificially restricted to 425 BPH which inhibits pressure relief under abnormal operating scenarios.

The Divert Valves on the Riser and Main Fractionator did not function properly which allowed feed to enter the riser upon restarting of the unit charge pumps.

Preventative Actions (Actions to reduce likelihood of Recurrence):

Review/Modify 1232 Absorber Start Up Procedure "FCC III-A- 3 START ABSORBER TOWER E-201" and "III-A-12 START ABSORBER UPPER REBOILE" to include temperature target for Absorber Bottom.

Initiate Repair Plan for C-220 Exchanger during next turn around.

Initiate Repair Plan for Riser and Main Fractionator Divert Valves and return to service.

Review/Modify Procedure "FCC II-A-26 START TORCH OIL" to increase WGS pH to 7.5 target during 1232 start up sequence.

Work with Operations to develop a procedure for resetting safety interlocks on 1232 and 531. Specifically 531 X-C-11, Loss of Ammonia Injection at the SCR.

Review and consider increasing the set point limit of 12FC016 to a value > 425 BPH to improve pressure relief capability on E-209.

Do Stipulated Penalties Apply? (Acid Gas Flaring Only) YES ☐ NO ☒

If YES explain:

- ☐ Yes ☐ No **Error resulting from careless operation.**
- ☐ Yes ☐ No **Failure to follow written procedures.**
- ☐ Yes ☐ No **Failure of equipment due to failure by Sunoco to operate and maintain equipment in a manner consistent with good engineering practices**
- ☐ Yes ☐ No **SO_2 rate greater than 20 lbs/hour continuously for 3 hours or more where SUNOCO did not follow PMO plan and took no action to limit duration and/or quantity of SO_2 emissions.**
- ☐ Yes ☐ No **More than five acid gas flaring incidents in rolling 12 months period.**

If NO explain:
Hydrocarbon Flaring Event

If corrective actions are not completed within 45 days from the end date of the incident, list the projected date for the follow-up report which will show corrective actions and preventive actions:

N/A: ☐ **Completed:** ☐ **Not Completed:** ☒ **Explain:** Several items will require the unit to be shut down during a turn around to implement the preventive action.

Approval Section		
Title	**Print Name**	**Date**
Environmental Engineer:	Glenn Tashjian	1/14/2010
Environmental Lead:	Charles D. Barksdale Jr.	1/18/2010
Operations Manager:	Stephen J. Koczirka	1/18/2010

Date of Report:	**Jan 14, 2010**	**Incident Type: (check one)**	**Acid Gas Flaring:** ☐ **Tail Gas Flaring:** ☐ **Hydrocarbon Flaring:** ☒

Calculation of Quantity of SO_2 Released from Flaring (Round to the nearest 0.1 Tons):

$$\text{Tons of } SO_2 = [FR][TD][Conc H_2S][8.44 \times 10^{-5}].$$

FR = Average Flow Rate to Flaring Device(s) during Flaring Incident in standard cubic feet per hour

TD = Total Duration of Flaring Incident in hours

$Conc H_2S$ = Average Concentration of Hydrogen Sulfide in gas during Flaring Incident (or immediately prior to Flaring Incident if all gas is being flared) expressed as a volume fraction (scf H_2S/scf gas)

8.44×10^{-5} = [lb mole H_2S/379 scf H_2S][64 lbs SO_2/lb mole H_2S][Ton/2000 lbs]

Reason for any missing data: N/A
Basis for any data that was estimated: Engineering calculation based on characteristics of process stream and design basis of pressure relief device.

Tons of SO_2 = 0.39

Rate of SO_2 Emissions During Flaring:

$$ER = [FR][Conc H_2S][0.169].$$

ER = Emission Rate in pounds of SO_2 per hour

FR = Average Flow Rate to Flaring Device(s) during Flaring Incident in standard cubic feet per hour

$Conc H_2S$ = Average Concentration of Hydrogen Sulfide in gas during Flaring Incident (or immediately prior to Flaring Incident if all gas is being flared) expressed as a volume fraction (scf H_2S/scf gas)

0.169 = [lb mole H_2S/379 scf H_2S][1.0 lb mole SO_2/1 lb mole H_2S][64 lb SO_2/1.0 lb mole SO_2]

Reason for any missing data: N/A
Basis for any data that was estimated: Engineering calculation based on characteristics of process stream and design basis of pressure relief device.

Emission Rate of SO_2 = 34.7 pound per hour

If Tail Gas exceeding the 250 ppmvd (NSPS J limit) is emitted from a monitored SRP incinerator, then the following formula applies:

$$ER_{TGI} = \sum_{i=1}^{TD_{TGI}} [FR_{Inc.}]_i [Conc.\ SO_2 - 250]_i [0.169 \times 10^{-6}] [(20.9 - \%\ O_2)/20.9]_i$$

Where:

ER_{TGI} = Emissions in excess of the 250 ppm limit from the Tail Gas Unit at the SRP incinerator, pounds of SO_2 over a 24-hour period

TD_{TGI} = Hours when the incinerator CEM was exceeding 250 ppmvd SO_2 on a rolling twelve hour average, corrected to 0% O2, in each 24-hour period of the Incident

i = Each hour within TD_{TGI}

$FR_{Inc.}$ = Incinerator Exhaust Gas Flow Rate (standard cubic feet per hour, dry basis) (actual stack monitor data or engineering estimate based on the acid gas feed rate to the SRP) for each hour of the Incident

Conc. SO_2 = The average SO_2 concentration (CEMS data) that is greater than 250 ppm in the incinerator exhaust gas, ppmvd corrected to 0% O_2, for each hour of the Incident

% O_2 = O_2 concentration (CEMS data) in the incinerator exhaust gas in volume % on dry basis for each hour of the Incident

0.169×10^{-6} = [lb mole of SO_2 / 379 SO_2] [64 lbs SO_2 / lb mole SO_2] [1 x 10^{-6}]

Standard conditions = 60 degree F; 14.7 lb_{force}/sq.in. absolute

Reason for any missing data: N/A
Basis for any data that was estimated: N/A

Comments:

This RCFA Report was extracted from a Sunoco internal incident investigation report completed on July 28, 2009.

APPENDIX II

Philadelphia
Hydrocarbon Flaring – September 14, 2009
Root Cause Failure Analysis

Investigation Report for Acid Gas, Sour Water Gas, Tail Gas, or Hydrocarbon Flaring Resulting in ≥ 500 lbs. of SO_2 Released

Date of Report:	Jan 14, 2010	**Incident Type:** (Check one)	☐ Acid Gas Flaring: ☐ Tail Gas Flaring: ☒ Hydrocarbon Flaring:
Date(s) of Incident:	(Beginning) 9/14/2009 (End) 9/14/2009	**1st Flaring start/end time:**	(start) 7:00 PM (end) 6:54 AM
		2st Flaring start/end time:	(start) (end)
		3st Flaring start/end time:	(start) (end)
Amount of SO_2 Released:	877 Pounds ☒ Tons ☐	**Location at the Philadelphia Refinery:**	SWS Flare ☐ 1231/2 Flare ☒ AG Flare ☐ SY N Flare ☐ North Flare ☐ 433 Flare ☐

Incident Description:
1232 Unit was restarted on 9/14/09 following a 39-day outage. Feed was introduced into the unit at 1:50 PM. Intermittent flaring resulted during the startup of the unit. The flaring occurred intermittently from 9/14/09 7:00 PM to 9/15/09 6:54 AM. Two operators were staffed in the Central Control Room during the startup of the unit.

At 7:00 PM on 9/14, the Absorber bottoms temperature (12TI37) decreased from 173°F to 135°F and remained at this level for approximately 10 hours. Low bottoms temperature on the Absorber allowed light ends to travel further into the Recovery-Side and bottleneck downstream towers/equipment. At 5:30 AM on 9/15, the low temperature was recognized by the Central Control Room, CCR, operator at 1232 unit when he reviewed the unit operation at the start of his shift on dayshift (9/15). The CCR operator than raised the absorber bottoms temperature (12TI37) to 189°F. The intermittent flaring subsequently subsided at 6:30 AM on 9/15.

Steps taken to limit duration of flaring or quantity of SO2/Hydrocarbon released (Corrective Actions):
Two operators were staffed in the Central Control Room during the startup of the unit.

Initiate a Serious Incident Investigation to understand any cause of intermittent flaring during the restart of 1232 FCCU. Develop preventative action plan(s) for future restarts to mitigate flaring.

Root Cause of Incident:
Procedure FCC-III-A-12 identifies the need to maintain sufficient bottoms temperature on the Absorber during startup of the tower to mitigate sending light-end material downstream to the recovery-side of the unit. Operator did not follow this procedural step during the start-up.

Contributing Causes of Incident:
Startup of 1232 FCCU unit is complex, and typically requires two console operators to manage unit operation until the unit approaches "steady state". During startup, numerous process variables need to be managed simultaneously until the unit becomes full of material and "lines out".

During the investigation, it was discovered that there are several temperature indicators on the Absorber/Stripper PKS (control room) graphic that did not accurately represent their location in the field. 12TI41 is physically on the shell-side outlet of C-203A/B bundle. On the PKS graphic, this TI is positioned on the shell-side inlet of C-203A/B. Operators may have assumed this temperature was representative of the liquid on the bottom tray of the Absorber. Also, 12TI42 is physically located on the tube-side outlet of C-203A/B bundle downstream of 12TC700 valve bypass line around C-203. On the PKS graphic, this TI is positioned on the shell-side outlet of C-220 bundle. Finally, 12TC700 takes its temperature reading from the shell-side outlet of C-203A/B bundle in the field. The Absorber/Stripper PKS graphic suggests the reading is taken on the shell-side inlet of C-203A/B bundle which is incorrect.

Preventative Actions (Actions to reduce likelihood of Recurrence):
Communicate incident investigation report with all crews at 1232 Unit.

Relocate 12TI41 on the Absorber/Stripper PKS graphic to its proper location (C-203A/B shell-side outlet). Present graphic display has the TI located on the shell-side inlet. Relocate 12TI42 on the Absorber/Stripper PKS graphic to its proper location (C-203A/B tube-side outlet downstream of the 12TC700 valve bypass line). Present graphic display has the TI located on the shell-side outlet of C-220. Change the PKS graphic display for 12TC700 that indicates the C-203A/B shell-side outlet temperature. On the Absorber/Stripper PKS graphic, it suggests the instrument reads from the shell-side inlet of C-203A/B.

Review startup procedures FCC-III-A and FCC-III-A-3. Determine if editorial changes are needed which state that mitigation of flaring should be given high priority when starting up the unit.

Do Stipulated Penalties Apply? (Acid Gas Flaring Only) YES ☐ NO ☒

If YES explain:

- ☐ Yes ☐ No **Error resulting from careless operation.**
- ☐ Yes ☐ No **Failure to follow written procedures.**
- ☐ Yes ☐ No **Failure of equipment due to failure by Sunoco to operate and maintain equipment in a manner consistent with good engineering practices**
- ☐ Yes ☐ No **SO_2 rate greater than 20 lbs/hour continuously for 3 hours or more where SUNOCO did not follow PMO plan and took no action to limit duration and/or quantity of SO_2 emissions.**
- ☐ Yes ☐ No **More than five acid gas flaring incidents in rolling 12 months period.**

If NO explain:
Hydrocarbon Flaring Event

If corrective actions are not completed within 45 days from the end date of the incident, list the projected date for the follow-up report which will show corrective actions and preventive actions:

N/A: ☐ **Completed:** ☐ **Not Completed:** ☒ **Explain:** PKS graphic changes will be completed by 1/31/2010.

Approval Section		
Title	**Print Name**	**Date**
Environmental Engineer:	Glenn Tashjian	1/14/2010
Environmental Lead:	Charles D. Barksdale Jr.	1/18/2010
Operations Manager:	Stephen J. Koczirka	1/18/2010

Date of Report:	**Jan 14, 2010**	**Incident Type: (check one)**	**Acid Gas Flaring:** ☐
			Tail Gas Flaring: ☐
			Hydrocarbon Flaring: ☒

Calculation of Quantity of SO_2 Released from Flaring (Round to the nearest 0.1 Tons):

$$\text{Tons of } SO_2 = [FR][TD][Conc H_2S][8.44 \times 10^{-5}].$$

FR = Average Flow Rate to Flaring Device(s) during Flaring Incident in standard cubic feet per hour

TD = Total Duration of Flaring Incident in hours

$Conc H_2S$ = Average Concentration of Hydrogen Sulfide in gas during Flaring

Incident (or immediately prior to Flaring Incident if all gas is being flared) expressed as a volume fraction (scf H_2S/scf gas)

8.44×10^{-5} = [lb mole H_2S/379 scf H_2S][64 lbs SO_2/lb mole H_2S][Ton/2000 lbs]

Reason for any missing data: N/A
Basis for any data that was estimated: Engineering calculation based on characteristics of process stream and design basis of pressure relief device.

Tons of SO_2 = 0.44

Rate of SO_2 Emissions During Flaring:

$$ER = [FR][Conc H_2S][0.169].$$

ER = Emission Rate in pounds of SO_2 per hour

FR = Average Flow Rate to Flaring Device(s) during Flaring Incident in standard cubic feet per hour

$Conc H_2S$ = Average Concentration of Hydrogen Sulfide in gas during Flaring Incident (or immediately prior to Flaring Incident if all gas is being flared) expressed as a volume fraction (scf H_2S/scf gas)

0.169 = [lb mole H_2S/379 scf H_2S][1.0 lb mole SO_2/1 lb mole H_2S][64 lb SO_2/1.0 lb mole SO_2]

Reason for any missing data: N/A
Basis for any data that was estimated: Engineering calculation based on characteristics of process stream and design basis of pressure relief device.

Emission Rate of SO_2 = 87.7 pound per hour

If Tail Gas exceeding the 250 ppmvd (NSPS J limit) is emitted from a monitored SRP incinerator, then the following formula applies:

$$ER_{TGI} = \sum_{i=1}^{TD_{TGI}} [FR_{Inc.}]_i [Conc.\ SO_2 - 250]_i [0.169 \times 10^{-6}] [(20.9 - \%\ O_2)/20.9]_i$$

Where:

ER_{TGI} = Emissions in excess of the 250 ppm limit from the Tail Gas Unit at the SRP incinerator, pounds of SO_2 over a 24-hour period

TD_{TGI} = Hours when the incinerator CEM was exceeding 250 ppmvd SO_2 on a rolling twelve hour average, corrected to 0% O2, in each 24-hour period of the Incident

i = Each hour within TD_{TGI}

$FR_{Inc.}$ = Incinerator Exhaust Gas Flow Rate (standard cubic feet per hour, dry basis) (actual stack monitor data or engineering estimate based on the acid gas feed rate to the SRP) for each hour of the Incident

Conc. SO_2 =	The average SO_2 concentration (CEMS data) that is greater than 250 ppm in the incinerator exhaust gas, ppmvd corrected to 0% O_2, for each hour of the Incident
% O_2 =	O_2 concentration (CEMS data) in the incinerator exhaust gas in volume % on dry basis for each hour of the Incident
0.169×10^{-6} =	[lb mole of SO_2 / 379 SO_2] [64 lbs SO_2 / lb mole SO_2] [1 x 10^{-6}]

Standard conditions = 60 degree F; 14.7 lb_{force}/sq.in. absolute

Reason for any missing data: N/A
Basis for any data that was estimated: N/A

Comments:

This RCFA Report was extracted from a Sunoco internal incident investigation report completed on November 20, 2009.

Appendix III. CD Paragraph 77 Sampling Results Philadelphia Refinery

Sample Point ID	Sample Date	Benzene Conc (ppmw)	Avg 3rd Qtr 2009 Benzene Conc. (ppmw)	Avg 4th Qtr 2009 Benzene Conc. (ppmw)	3rd Qtr 2009 Flow (gal)	4th Qtr 2009 Flow (gal)	3rd 2009 Benzene Quantity (Megagrams)	4th Qtr 2009 Benzene Quantity (Megagrams)
210 Box Cooler (PB EOL 001)	07/13/09	0.00099	0.00099		74235000		0.0003	0.0003
	08/17/09	0.00099						
	09/14/09	0.00099						
	10/13/09	0.00099		0.00099		74235000		
	11/10/09	0.00099						
	12/14/09	0.00099						
Klondike Effluent (PB EOL 002)	07/13/09	0.00099	0.001		10000000		0.00004	0.00006
	08/18/09	0.001						
	09/14/09	0.00099						
	10/13/09	0.00099		0.0017		10000000		
	11/10/09	0.00099						
	12/14/09	0.003						
867 Effluent (PB EOL 003)	07/13/09	0.00099	0.0023		22625000		0.0002	0.00008
	08/18/09	0.00099						
	09/15/09	0.0049						
	10/14/09	0.00099		0.00099		22625000		
	11/11/09	0.00099						
	12/16/09	0.00099						
PB Grit Chamber Effluent (PB EOL 004)								
No samples taken this period - not required. Grit chamber samples were only required to be sampled for one quarter and this had already occurred in early 2008.								

Sample Point ID	Sample Date	Benzene Conc (ppmw)	Avg 3rd Qtr 2009 Benzene Conc. (ppmw)	Avg 4th Qtr 2009 Benzene Conc. (ppmw)	3rd Qtr 2009 Flow (gal)	4th Qtr 2009 Flow (gal)	3rd Qtr 2009 Benzene Quantity (Megagrams)	4th Qtr 2009 Benzene Quantity (Megagrams)
1232 4th and M (GP EOL 001)	07/13/09	0.004	0.015		71500000		0.004	0.044
	08/17/09	0.02						
	09/14/09	0.022						
	10/13/09	0.004		0.162		71500000		
	11/10/09	0.003						
	12/14/09	0.48						
231 F Box Discharge (GP EOL 002)	07/13/09	3.7	1.243		3450000		0.016	0.0003
	08/18/09	0.021						
	09/15/09	0.008						
	10/14/09	0.031		0.023		3450000		
	11/11/09	0.007						
	12/16/09	0.031						
231 Groundwater (GP EOL 003)	07/13/09	0.11	0.11		477333		0.0002	0.0004
	08/2009	*No sample						
	09/2009	*No sample						
	10/2009	*No sample		0.21		477333		
	11/2009	*No sample						
	12/14/09	0.021						
* Groundwater system not operational at the time of sampling.								
#3 Separator Effluent (GP EOL 004)	07/13/09	0.00099	0.00099		3150000		0.00001	0.00001
	08/18/09	0.00099						
	09/14/09	0.00099						
	10/13/09	0.00099		0.00099		3150000		
	11/11/09	0.00099						
	12/15/09	0.00099						

Sample Point ID	Sample Date	Benzene Conc (ppmw)	Avg 3rd Qtr 2009 Benzene Conc. (ppmw)	Avg 4th Qtr 2009 Benzene Conc. (ppmw)	3rd Qtr 2009 Flow (gal)	4th Qtr 2009 Flow (gal)	3rd Qtr 2009 Benzene Quantity (Megagrams)	4th Qtr 2009 Benzene Quantity (Megagrams)
8 Separator Effluent (GP EOL 005)	07/13/09	0.00099	0.00099		8300000		0.00003	0.00003
	08/18/09	0.00099						
	09/14/09	0.00099						
	10/13/09	0.00099		0.00099		8300000		
	11/11/09	0.00099						
	12/15/09	0.00099						
15 Pumphouse (PB Non-EOL 001)	07/14/09	0.21	0.14		15000		0.000008	0.000002
	08/17/09	0.001						
	09/14/09	0.21						
	10/13/09	0.01		0.028		15000		
	11/10/09	0.057						
	12/14/09	0.017						
1232 Sewer M Street (GP EOL 006)	07/2009	*No sample	0.0		4700000		0.0	0.011
	08/2009	*No sample						
	09/2009	*No sample						
	10/14/09	9.9(P)		6.15(P) 0.005(W)		4700000		
	11/12/09	2.4(P) 0.009(W)						
	12/16/09	0.00099						

* For the 3rd quarter of 2009, either the 1232 unit was on a turnaround (August - Mid September) or there was no flow observed in the sewer. For the 4th quarter of 2009, 10% product (P) and 90% water (W) was observed during the October and November sampling events. Samples were collected and analyzed for both water and product phases. For the December 2009 sampling event, 100% water (no product) was observed.

Sample Point ID	Sample Date	Benzene Conc (ppmw)	Avg 3rd Qtr 2009 Benzene Conc. (ppmw)	Avg 4th Qtr 2009 Benzene Conc. (ppmw)	3rd Qtr 2009 Flow (gal)	4th Qtr 2009 Flow (gal)	3rd Qtr 2009 Benzene Quantity (Megagrams)	4th Qtr 2009 Benzene Quantity (Megagrams)
V-4 Hydrobon Separator Condensate Wash (GP Non-EOL 001)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
No waste was generated from this Non-EOL point during the semi-annual period.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
V-603 Debutanizer Receiver Condensate Wash (GP Non-EOL 002)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
No waste was generated from this Non-EOL point during the semi-annual period.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3rd Qtr 2009 EOL Sampling TAB = 0.021 Megagrams
4th Qtr 2009 EOL Sampling TAB = 0.056 Megagrams

Overall (total) Annual 2009 EOL Sampling TAB = 0.38 Megagrams

Notes:

1. *Benzene concentrations listed as 0.00099 ppm were reported by the laboratory as < 0.001 ppm which is the detection limit.*
2. *Average quarterly benzene concentrations are simply the arithmetic mean of the individual laboratory results for the quarter.*
3. Sample calculation of 4th Qtr Benzene Quantity for GP EOL 002:

4th Qtr avg benzene conc. = 0.023 ppm
4th Qtr flow = 3,450,000 gallons

So: $\frac{0.023 \text{ ppm benzene} \times 3{,}450{,}000 \text{ gallons} \times 8.34 \text{ lbs/gallon}}{2204.6 \text{ lbs/megagram} \times 1{,}000{,}000 \text{ parts per million}} = 0.0003$ Megagrams

Sunoco Facility: Toledo Refinery
Report Title: Semi-annual Consent Decree Compliance Report #8
Reporting Period: 07/01/09 - 12/31/09

Paragraph 114 Reporting and Recordkeeping of Affirmative Relief / Environmental Projects and Emission Data in Section V with Certification

I Progress Report for Implementation of (section V) Affirmative Relief/Environmental Projects

A. NOx Emissions Reductions from the FCCU

The SCR construction was completed and unit started up in September 2009. NOx emissions are being monitored as required.

B. SO2 Emissions Reductions from the FCCU

Wet Gas Scrubber construction was completed and unit started up in September 2009. SO2 emissions are being monitored as required.

C. Control of PM Emissions from FCCU

Wet Gas Scrubber (with particulate control) construction was completed and unit started up in September 2009. Alternative Monitoring plan is in place to monitor particulate removal efficiency. The values will be set during the performance testing scheduled for the first quarter of 2010.

D. Control of CO Emissions from FCCU

The Toledo Refinery is monitoring CO compliance as required. There were deviations during the reporting period (related to startup, shutdown or malfunction) that are reported separately in the quarterly and semiannual reports submitted to Ohio EPA.

E. NSPS Subparts A and J Applicability at FCCU Regenerators

The SCR and Wet Gas Scrubber (with particulate control) construction was completed and units started-up in September 2009. The PTI for the FCC Unit construction specified that NSPS is applicable to the FCCU regenerator.

F. NO_x Emission Reductions from Heaters and Boilers

The updated NOx control plan was submitted 07/14/2009.

G. SO_2 Emissions Reductions from and NSPS Applicability for Heaters and

Boilers

Construction of the new SRU and two new Tail Gas Treating Units was completed during the 4th quarter of 2009. Both SRU/TGTU trains were in service by 12/31/2009. The new SRU/TGTU complex includes back up amine treating capability for the fuel gas system during turnarounds of the refinery amine unit.

A new fuel gas analyzer was installed and various vents were reconfigured in the refinery fuel gas system during the 4th quarter of 2009. The new analyzer was placed in service in December 2009.

I. Sulfur Recovery Plants - NSPS Applicability

1. **Construction of the SRU and two new tail gas units was completed during the 4th quarter of 2009. Both SRU/TGTU trains were in-service by 12/31/2009.**

2. **The results of implementing the SRU Optimization Study (submitted by 09/10/06) were submitted 03/12/07. The recommendations were implemented as of that date.**

3. **As part of ensuring the SRU was operating optimally, Sunoco agreed to monitor the bottom temperatures of the 2nd and 3rd reactor beds and report in this report those days in which the temperature was out of range. For the period between July 1 and December 31, 2009, there were five days when the temperatures were outside the identified range. On August 1, the 2nd bed temperature fell below the range identified in the Optimization Study. On August 3, September 24 and September 25, the 3rd bed temperature was above the range specified in the Optimization Study. These excursions were caused by operating the SRU below optimum processing rates during the beginning and end of a refinery turnaround. On October 11, the 3rd bed temperature was above the range specified in the Optimization Study. This was caused by a valve that would not close. Steam leaked through and caused the bed temperature to rise above the specified range. Note that since the SRU is now subject to NSPS, the bed temperature excursions will no longer be reported in the Sunoco semiannual Progress Report.**

4. **The PMO plan was updated to include the new SRU and two TGTUs.**

J. Hydrocarbon Flaring Devices

Ongoing review of the vents to the Plant 4 and Plant 9 flares was performed during this period. Sunoco submitted an Alternate Monitoring Plan for the Plant 4 flare in July 2009 to US EPA. The plan is awaiting approval. The car seals specified in the plan were installed and the refinery is complying with the AMP for the Plant 4 flare by 12/31/09 as specified in the CD.

K. Control of Acid Gas Flaring and Tail Gas Incidents

There were five acid gas flaring incidents between 07/01/09 and 12/31/09. The reports for incidents on 8/22, 9/21, 10/27 and 11/26 have been submitted as required by the CD. The 12/12 incident report will be completed in January 2010.

L. Control of Hydrocarbon Flaring Incidents

Four hydrocarbon flaring incidents occurred between 07/01/09 and 12/31/09. Attached with this report are the three hydrocarbon flaring incident reports for incidents occurring on 7/28, 8/01, and 10/27, in Appendices I, II, and III respectively. The 12/12 incident report will be completed in January 2010.

M. Benzene Waste NESHAP Program Enhancements

1. **Required Training on BWON Controls has been implemented through:**
   - **Weekly Safety Topics for Refinery Employees.**
   - **HES Supervisory Training for Management & Supervision.**
   - **CA Training for Contract Administrators.**
   - **Sampling Procedure for BWON Coordinator.**
   - **Computer Based Learning for Refinery Employees.**

2. **The BWON exempted quantity was calculated for the third (0.13 MG) and fourth (0.12 MG) quarters of 2009. The projected BWON exempted quantity based on the calculations is well under the 2 MG exemption, which is currently estimated to be 0.55 MG.**

N. Leak Detection and Repair Program Enhancements

1. **Required Training on LDAR has been implemented through:**
   - **Weekly Safety Topics for Refinery Employees.**
   - **CA Training for Contract Administrators.**
   - **LDAR Contractor Training & Exams provided by EA, Inc.**
   - **Sunoco LDAR Conference for LDAR Coordinator.**
   - **Computer Based Learning for Refinery Employees.**

2. **LDAR Coordinator Stephenie Sibberson attended the Sunoco Corporate LDAR Conference in October 2009.**

3. **The LDAR Coordinator for the reporting period is Stephenie Sibberson.**

O. Incorporation of Consent Decree Requirements into Federally Enforceable Permit(s)

An updated Title V permit application that included the CD requirements was submitted to Ohio EPA in accordance with Ohio EPA preferences during the 2nd half of 2006. The Permit to Install for the CD control devices/refinery upgrades also included the CD

requirements for emission limits and standards. TDES is in the process of revising the Title V permit for the Toledo refinery.

II. Summary of (section V) Emissions Data

Included herein.

III. Description of Any Problems Anticipated with Meeting (section V) Requirements

None

IV. Additional Matters to be Brought to the Attention of EPA and the Appropriate Plaintiff/Intervenor

None

Paragraph 112 SUPPLEMENTAL AND COMMUNITY ENVIRONMENTAL PROJECTS (SCEP) AND STATE AND LOCAL ENVIRONMENTALLY BENEFICIAL PROJECTS (SLEBP) in Section VIII with Certification

I. Progress Report for Each SCEP or SLEBP (section VIII)

Paragraph 104: In progress

Paragraph 105: Complete

Paragraph 106: Complete

Paragraph 107: Complete

Paragraph 108: Complete

Paragraph 109: Complete

II. Completed SCEP or SLEBP (section VIII)

A. Detailed Description of Each SCEP or SLEBP Project as Implemented

None

B. Brief Description of Any Significant Operating Problems Encountered

None

C. Certification That Each Project Has Been Fully Implemented Pursuant to the

Provisions of this Consent Decree

See the certification behind the cover letter.

D. Description of the Environmental and Public Health Benefits Resulting From Implementation of Each Project (including quantification of the benefits and pollutant reductions, where practicable)

N/A

APPENDIX I

Toledo
Hydrocarbon Flaring – July 28, 2009
Root Cause Failure Analysis

Investigation Report for Acid Gas Flaring, Hydrocarbon Flaring or Tail Gas Incidents Resulting in ≥ 500 lbs. of SO_2 Released

Date of Report:	**08/07/2009**		**Incident Type** (Check one)	**Acid Gas Flaring:** ☐ **Tail Gas Incident:** ☐ **Hydrocarbon Flaring** ☒
Agency Report #	**0907-48-2214**			
Date(s) of Incident:	(Beginning) **7/28/2009** (End) **7/29/2009**		**1st Flaring start/end time:**	7/28 01:13 – 07:37
			2nd Flaring start/end time:	7/28 23:10 – 7/29 01:13
			3rd Flaring start/end time:	NA
Amount of SO_2 Released:	**1104** See attached Form	Pounds ☒ Tons ☐	**Location at the Toledo Refinery:**	**Plant 4 Flare** ☒ **Plant 9 Flare** ☐ **SRU Incinerator Stack** ☐

Incident Description:

At approximately 01:13 28-Jul-09, the refinery experienced an upset in FCC wet gas composition. Low gravity wet gas to C-421, the FCC wet gas compressor, caused the compressor to approach surge condition and the spillback valves to open. The compressor could not effectively move the gas and C421 suction pressure increased such that the suction PCV opened to flare to regain control. Gases normally processed by the compressor were safely burned at the Plant 4 flare (P009). Since this gas contains sulfur compounds, SO2 was released. The refinery made operational changes at the FCC unit to return the wet gas to normal and end the release at 07:37 28-Jul-09. A later incident (23:10 28-Jul-09 to 01:13 29-Jul-09) released approx. 97 pounds SO2 which is under the RQ but is included in the total for the 24 hour period.

Steps taken to limit duration of flaring or quantity of SO_2/Hydrocarbon released (Corrective Actions):

Sunoco increased the FCC overhead temperature to heavy up (increase gravity of) the FCC wet gas. With a more typical gas the compressor could again move the material.

Root Cause of Incident:

This incident was caused by an operational upset at the FCC unit. During the upset reactor temperature increased and the overhead temperature decreased. This situation increased wet gas production. At the same time the composition became lighter due to excess cooling which allowed more heavy materials to condense out of the wet gas. The wet gas gravity decreased and the light material could not be moved efficiently by C-421, FCC wet gas compressor.

Contributing Causes of Incident:

During the week of 7/26/09, the refinery was making final preparations for the planned August 1 FCC turnaround. As a result, the refinery crude diet and thus FCC feed were changing.

Preventive Actions (Actions to reduce likelihood of Recurrence):

This incident was reviewed with Operations supervision to understand the emissions impacts.

Do Stipulated Penalties Apply?	YES	☐	NO	☒	

If YES explain:

If corrective actions are not completed within 45 days from the end date of the incident, list the projected date for the follow-up report which will show corrective actions and preventive actions:

N/A: ☐ **Completed:** ☒ **Not Completed:** ☐ **Explain:**

Approval Section			
Title	**Print Name**	**Signature**	**Date**
Operations Manager:	Jack C. Parsil	Original signed by JCP	09/05/2009
Environmental Manager:	Elaine M. Moore	Original signed by EMM	09/04/2009

Date of Incident:	**7/28/2009**	**Incident Type**	**Acid Gas Flaring:** ☐
Agency Report #	**0907-48-2214**	(Check one)	**Hydrocarbon Flaring** ☒
			Acid Gas Flaring: ☐

Calculation of Quantity of SO_2 Released from Gas Flaring (Round to the nearest 0.1 Tons):
Tons of SO_2 = [FR][TD][ConcH_2S][8.44x10^{-5}] (See p. 52 of 114 CD)
FR = Average Flow Rate of Gas During Flaring Incident in scfh
TD = Total Duration of Flaring Incident in hours
ConcH_2S = Average Concentration of Hydrogen sulfide in gas during flaring incident
8.44x10^{-5} = [lb mole H_2S/379 scf H2S][64 lbs SO_2/lb mole H_2S][1 Ton/2000 lbs]

Reason for any missing data: No data was missing.
Basis for any data that was estimated: Flows were estimated based on valve design data and process operating conditions during release. Concentrations were based on the most recent available lab data.

Release No. 1: [(97240 scfh)*(6.2 hrs)*(0.099 mol H_2S/mol gas]*(8.44E-05) = 0.50 tons
Tons of SO_2 = 0.503 tons total SO_2 released (1007 pounds)

Release No. 2: [(2930 scfh)*(2 hrs)*(0.099 mol H_2S/mol gas]*(8.44E-05) = 0.049 tons
Tons of SO_2 = 0.049 tons total SO_2 released (97 pounds)

Release No. 3: NA

Total SO_2 released = 0.55 tons (1104 pounds)

Rate of SO_2 Emissions During Gas Flaring: ER = [FR][ConcH_2S][0.169]
ER = Emission Rate in pounds of SO2 per hour
Pounds per hour of SO_2 = [FR][ConcH_2S][0.169] (See p. 52 of 114 CD)
FR = Flow Rate of Gas During Flaring Incident in scfh
ConcH_2S = Average Concentration of Hydrogen sulfide in gas during flaring incident
0.169 = [lb mole H_2S/379 scf H_2S][1.0 lb mole SO_2/1 lb mole H2S][64 lbs SO_2/lb mole SO_2]

Reason for any missing data: No data was missing.
Basis for any data that was estimated: Flows were estimated based on valve design data and process operating conditions during release. Concentrations were based on the most recent available lab data.
Note: Hourly emission rate is calculated over the full duration of the intermittent incident

Release No. 1: ER = 1007 lb SO2 / 6.2 hrs = 162.4 lb SO2/hr

Release No. 2: ER = 97 lb SO2 / 2.0 hrs = 48.5 lb SO2/hr

Comments:

	Name	Title	Date
Calculation Performed by:	Lynn Balogh	Lead Env. Eng	8/7/2009
Calculation Reviewed by:	E. M. Moore	Env. Manager	09/04/2009

APPENDIX II

Toledo
Hydrocarbon Flaring – August 1, 2009
Root Cause Failure Analysis

Investigation Report for Acid Gas Flaring, Hydrocarbon Flaring or Tail Gas Incidents Resulting in ≥ 500 lbs. of SO_2 Released

Date of Report:	**11/5/2009**		**Incident Type** (Check one)	**Acid Gas Flaring:** ☐ **Tail Gas Incident:** ☐ **Hydrocarbon Flaring** ☒
Agency Report #	**0908-48-2296**			
Date(s) of Incident:	(Beginning) **8/01/2009** (End) **9/26/2009**		**1st Flaring start/end time:**	8/01 00:01 – 9/26 23:32
			2nd Flaring start/end time:	NA
			3rd Flaring start/end time:	NA
Amount of SO_2 Released:	**98.3** See attached Form	Pounds ☐ Tons ☒	**Location at the Toledo Refinery:**	**Plant 4 Flare** ☒ **Plant 9 Flare** ☒ **SRU Incinerator Stack** ☐

Incident Description:

On 01-Aug-09, the refinery began a planned turnaround by shutting down the Fluid Catalytic Cracking (FCC) Unit and one crude unit. Feed was taken out of the sour water stripper at 23:00 03-Aug-09. The amine unit and SRU were shut down at 00:01 and 03:00 respectively on 04-Aug-09. During the turnaround, a portion of the untreated fuel gas was burned in the Plant 4 and Plant 9 flare systems. Since the gas contained sulfur compounds, SO2 was released during combustion.

The FCC wet gas compressor (C-421) restarted at 15:30 24-Sep-09 and FCC feed was introduced at approx. 05:00 26-Sep-09. During this start-up time frame, the refinery experienced fluctuating rate and composition of the gases in the compressor causing excess gas to be flared. The refinery returned to normal operation and sour gas flaring ceased as of 23:32 26-Sep-09.

Steps taken to limit duration of flaring or quantity of SO_2/Hydrocarbon released (Corrective Actions):

The refinery operated in accordance with a Sulfur Recovery Unit PMOP (submitted to Ohio EPA prior to the turnaround under OAC 3745-15-06 and the 1995 Director's Findings and Orders) to reduce emissions during the turnaround. The Sulfur Recovery Unit PMOP included conducting and submitting a dispersion modeling study ahead of the scheduled shutdown which demonstrated that no ambient air quality impacts would occur at the reduced refinery operating rates.

Root Cause of Incident:

The refinery was conducting a planned turnaround of several process units, including the refinery amine unit and sulfur recovery unit. During the turnaround, the refinery operated in accordance with the Sulfur Recovery Unit PMOP.

Contributing Causes of Incident:

NA

Preventive Actions (Actions to reduce likelihood of Recurrence):

The refinery will be starting up an additional SRU, two Tail Gas Units, and redundant amine regeneration capability by 12/31/2009.

Do Stipulated Penalties Apply?	YES	☐	NO	☒	

If YES explain:

If corrective actions are not completed within 45 days from the end date of the incident, list the projected date for the follow-up report which will show corrective actions and preventive actions:

N/A: ☐ **Completed:** ☒ **Not Completed:** ☐ **Explain:**

The refinery completed its planned turnaround on 9/26 and all process units returned to normal operation.

Approval Section			
Title	**Print Name**	**Signature**	**Date**
Operations Manager:	Jack C. Parsil	(original signed by Amy Wagner for JCP)	11/06/2009
Environmental Manager:	Elaine M. Moore	(original signed by EMM)	11/06/2009

Date of Incident:	**8/01/2009**	**Incident Type**	**Acid Gas Flaring:** ☐
Agency Report #	**0908-48-2296**	(Check one)	**Hydrocarbon Flaring** ☒
			Acid Gas Flaring: ☐

Calculation of Quantity of SO_2 Released from Gas Flaring (Round to the nearest 0.1 Tons):
Tons of SO_2 = [FR][TD][ConcH_2S][8.44x10^{-5}] (See p. 52 of 114 CD)
FR = Average Flow Rate of Gas During Flaring Incident in scfh
TD = Total Duration of Flaring Incident in hours
ConcH_2S = Average Concentration of Hydrogen sulfide in gas during flaring incident
8.44x10^{-5} = [lb mole H_2S/379 scf H2S][64 lbs SO_2/lb mole H_2S][1 Ton/2000 lbs]

Reason for any missing data: No data was missing.
Basis for any data that was estimated: Flows were estimated using engineering judgment. Concentration was based on knowledge of the gas being flared.

Release No. 1: [(142,000 scfh)*(1367.5 hrs)*(0.006 mol H_2S/mol gas]*(8.44E-05) = 98.3 tons

Tons of SO_2 = 98.3 tons total SO_2 released (196,500 pounds)

Release No. 2: NA

Release No. 3: NA

Total SO_2 released = 98.3 tons (196,500 pounds)

Rate of SO_2 Emissions During Gas Flaring: ER = [FR][ConcH_2S][0.169]
ER = Emission Rate in pounds of SO2 per hour
Pounds per hour of SO_2 = [FR][ConcH_2S][0.169] (See p. 52 of 114 CD)
FR = Flow Rate of Gas During Flaring Incident in scfh
ConcH_2S = Average Concentration of Hydrogen sulfide in gas during flaring incident
0.169 = [lb mole H_2S/379 scf H_2S][1.0 lb mole SO_2/1 lb mole H2S][64 lbs SO_2/lb mole SO_2]

Reason for any missing data: No data was missing.
Basis for any data that was estimated: Flows were estimated using engineering judgment and based on SWS feed rate. Concentration was based on knowledge of the gas being flared.

Release No. 1: ER = : (142,000 scfh)*(0.006 mol H_2S/mol gas)*(0.169) = 144 lb SO2/hr

Release No. 2: NA

Comments:

	Name	Title	Date
Calculation Performed by:	Lynn Balogh	Lead Env. Eng	11/05/2009
Calculation Reviewed by:	E. M. Moore	Env. Manager	11/05/2009

APPENDIX III

Toledo
Hydrocarbon Flaring – October 27, 2009
Root Cause Failure Analysis

Investigation Report for Acid Gas Flaring, Hydrocarbon Flaring or Tail Gas Incidents Resulting in ≥ 500 lbs. of SO_2 Released

Date of Report:	12/08/2009		**Incident Type** (Check one)	**Acid Gas Flaring:** ☐ **Tail Gas Incident:** ☐ **Hydrocarbon Flaring** ☒
Agency Report #	0910-48-3115			
Date(s) of Incident:	(Beginning) 10/27/2009 (End) 10/27/2009		**1st Flaring start/end time:**	10/27 14:30 – 21:30
			2nd Flaring start/end time:	NA
			3rd Flaring start/end time:	NA
Amount of SO_2 Released:	1.14 See attached Form	Pounds ☐ Tons ☒	**Location at the Toledo Refinery:**	**Plant 4 Flare** ☒ **Plant 9 Flare** ☐ **SRU Incinerator Stack** ☐

Incident Description:

At approximately 14:30 27-Oct-09, relief valves associated with the Depropanizer Tower, T-425, lifted to the Plant 4 flare during an upset of the tower. Operations manually decreased pressure to reseat the relief valves. Flaring decreased but did not stop completely. Operations investigated further and found two valves, one at E-486 and one at E-4006, did not reseat properly and the exchangers had to be bypassed to stop the release. The last exchanger was bypassed as of 21:30 27-Oct-09.

Since the gases routed to the Plant 4 flare contained sulfur compounds, SO2 was released during combustion.

Steps taken to limit duration of flaring or quantity of SO_2/Hydrocarbon released (Corrective Actions):

Operations manually decreased tower pressure to reseat the relief valves and bypassed equipment where the valves did not reseat properly. The valves that did not reseat were pulled and sent out for repair.

Root Cause of Incident:

This incident was initiated by a malfunction of the Depropanizer tower pressure transmitter. Pressure taps were plugged and indicated a lower than actual tower pressure. The false reading caused the pressure controllers to close, the system to overpressure and several relief valves to open.

Contributing Causes of Incident:

The P/4 Gas Plant was in start-up following an earlier, unrelated FCC Unit shutdown.

Preventive Actions (Actions to reduce likelihood of Recurrence):

1 - The T-425 pressure transmitter taps were cleared and the associated pressure controller was pulled and checked in the shop.

2 – The valves that did not reseat will be pulled and repaired. The relief valve on E-486 is complete. E-4006 is out of service until the repaired valve is re-installed.

Do Stipulated Penalties Apply?	YES	☐	NO	☒	

If YES explain:

If corrective actions are not completed within 45 days from the end date of the incident, list the projected date for the follow-up report which will show corrective actions and preventive actions:

N/A: ☐ **Completed:** ☒ **Not Completed:** ☐ **Explain:**

Approval Section			
Title	**Print Name**	**Signature**	**Date**
Operations Manager:	Jack C. Parsil	(original signed by JCP)	12/11/09
Environmental Manager:	Elaine M. Moore	(original signed by EMM)	12/10/09

Date of Incident:	**10/27/2009**	**Incident Type**	**Acid Gas Flaring:** ☐
Agency Report #	**0910-48-3115**	(Check one)	**Hydrocarbon Flaring** ☒
			Acid Gas Flaring: ☐

Calculation of Quantity of SO_2 Released from Gas Flaring (Round to the nearest 0.1 Tons):
Tons of SO_2 = [FR][TD][ConcH_2S][8.44x10^{-5}] (See p. 52 of 114 CD)
FR = Average Flow Rate of Gas During Flaring Incident in scfh
TD = Total Duration of Flaring Incident in hours
ConcH_2S = Average Concentration of Hydrogen sulfide in gas during flaring incident
8.44x10^{-5} = [lb mole H_2S/379 scf H2S][64 lbs SO_2/lb mole H_2S][1 Ton/2000 lbs]

Reason for any missing data: No data was missing.
Basis for any data that was estimated: Flows were estimated based on relief valve design data and process operating conditions during the release. Concentration was based on knowledge of the gas being flared.

Release No. 1: [(918,246 scfh)*(0.5 hrs)*(0.006 mol H_2S/mol gas]*(8.44E-05) +
(229,726 scfh)*(1.5 hrs)*(0.006 mol H_2S/mol gas]*(8.44E-05) +
(136,232 scfh)*(4.25 hrs)*(0.015 mol H_2S/mol gas]*(8.44E-05)] = 1.14 tons

Tons of SO_2 = 1.14 tons total SO_2 released (2,280 pounds)

Release No. 2: NA

Release No. 3: NA

Total SO_2 released = 1.14 tons (2,280 pounds)

Rate of SO_2 Emissions During Gas Flaring: ER = [FR][ConcH_2S][0.169]
ER = Emission Rate in pounds of SO2 per hour
Pounds per hour of SO_2 = [FR][ConcH_2S][0.169] (See p. 52 of 114 CD)
FR = Flow Rate of Gas During Flaring Incident in scfh
ConcH_2S = Average Concentration of Hydrogen sulfide in gas during flaring incident
0.169 = [lb mole H_2S/379 scf H_2S][1.0 lb mole SO_2/1 lb mole H2S][64 lbs SO_2/lb mole SO_2]

Reason for any missing data: No data was missing.
Basis for any data that was estimated: Flows were estimated based on relief valve design data and process operating conditions during the release. Concentration was based on knowledge of the gas being flared.

Release No. 1: ER = : 2,280 lb SO2 / 7 hrs = 326 lb SO2/hr

Release No. 2: NA

Comments:

	Name	Title	Date
Calculation Performed by:	Lynn Balogh	Lead Env. Eng	12/01/2009
Calculation Reviewed by:	E. M. Moore	Env. Manager	12/01/09